

Application Serial No. 10/758,263
Amendment dated January 18, 2005 (Tuesday after M.L.K. Day)
Reply to Office action of November 17, 2004

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1-38 (Cancelled)

39. (New) A speed control system for a transmission comprising an input pulley and an output pulley composed of variable pitch pulleys, and an endless belt movably wound around said input and said output pulleys, said speed control system comprising;

an input and an output pressure application device having a pressing force supply path that gives one pulley of said input and said output pulleys a reference function by applying a pressing force, and an elastic force supply path that gives the other pulley a follower function by applying an elastic force;

an input elastic member and an output elastic member applying to said input and said output pulleys the respective elastic force generated by being variably press-controlled in series via said input and said output pressure application devices, respectively;

a compound compressing device including two compressive devices disposed a semi-elastic force supply path to said pressing force supply path, so as to regulate a frictional pressure applied to said one pulley continuously after instructions has been stopped, with the use of a semi-elastic force that results from the simultaneous supply of the pressing force and the elastic force; and

a control device for making axial torque controls of both said input and output pulleys hold a low-speed range and/or a high-speed range into a higher transmitting efficiency, cooperating with the semi- elastic force applied to said one pulley and the elastic force applied to said the other pulley.

40. (New) The speed control system for said transmission according to claim 39, wherein said control device controls an amount of the semi-elastic force applied to said one pulley within such a range as not to change the radius of said belt predetermined by the supplied pressing force.

41. (New) The speed control system for said transmission according to claim 39, wherein, in compressing device, said semi-elastic force supply path and said pressing force

supply path are disposed in parallel to a movable disk of said one pulley including said movable disk and a fixed disk.

42. (New) The speed control system for said transmission according to claim 39, wherein, in said compound compressing device, each of said two compressing devices has an operating device and a sliding device that has two sliding members and a pressing device, in which said sliding device and /or said operating device are/is given a self-locking function.

43. (New) The speed control system for said transmission according to claim 42, wherein, in said compound compressing device, said sliding device is formed of a ball-screw operated by a worm transmission, or a hydraulic cylinder operated by a hydraulic valve.

44. (New) The speed control system for said transmission according to claim 41, wherein said compound compression device includes a superposing pressing end that receives the amount of displacement caused by both a primary compressing device and a secondary compressing device responsive to two instructions, and an individual pressing end that receives the amount of non-superposed displacement caused by either said primary compressing device or said secondary compressing device, or two individual pressing ends that receive the amounts of displacement caused by said primary compressing device and said secondary compressing device, respectively.

45. (New) The speed control system for said transmission according to claim 41, wherein, in said compound compressing device, one of said two sliding devices displaces the other and, one of said two sliding devices has an individual pressing end and the other sliding device has a superposing pressing end.

46. (New) The speed control system for said transmission according to claim 41, wherein said compound pressing device supplies said each of a primary instruction and a secondary instruction to at least two of said three sliding members composed of a shared sliding member and the other two sliding members in said two sliding devices.

47. (New) The speed control system for said transmission according to claim 45, wherein said compound compressing device supplies said pressing force via said individual pressing end and said elastic force via said superposing pressing end to said movable disk, so that said control device can regulate individually the amount of speed-change displacement of said movable disk and the amount of compressive displacement of said elastic device.

48. (New) The speed control system for said transmission according to claim 44, wherein said control device adds the amount of speed-change displacement to the amount of compressive displacement or subtracts the amount of speed-change displacement from the amount of compressive displacement, and said compound compressing device gives the resulting amount to said superposing pressing end.

49. (New) The speed control system for said transmission according to claim 39, wherein said control device detects and controls the pressing force, the elastic force or the semi-elastic force, using a pressure sensor disposed between said compound compressing device and a main body of said transmission.

50. (New) The speed control system for said transmission according to claim 39, wherein said compound compressing device is applied to at least either said input pressure application device when said belt is said press-type, or said output pressure application device when said belt is said pull-type, alternatively selected by means of a change of power supply paths between said input pulley and said output pulley.

51. (New) A speed control system for a transmission comprising an input shaft, an output shaft, a variable pitch input pulley mounted on said input shaft, a variable pitch output pulley mounted on said output shaft, and an endless belt wound around said input and output pulleys, said speed control system comprising:

- an input side pressure application device including;
- an input side compound compressing device having pressing ends that receive pressure from a primary compressing device and a secondary compressing device connected with two driving sources;

- a pressing force supply path in which one of the pressing ends presses an engagement device responsive to a supplied instruction; and

- an elastic force supply path disposed in parallel with a pressing force, in which the other pressing end presses in series an elastic device responsive to a supplied instruction;

- an output side pressure application device including;
- an output side compound compressing device having pressing ends that receive pressure from a primary compressing device and a secondary compressing device connected with two driving sources;

a pressing force supply path in which one of the pressing ends presses an engagement device responsive to a supplied instruction; and

an elastic force supply path disposed in parallel with a pressing force, in which the other pressing end presses in series an elastic device responsive to a supplied instruction;

transmission mode selection means for alternatively switching between a forward mode transmission in which said input side pressure application device performs a reference pulley function while said output side pressure application device performs a follower pulley function, and a reverse mode transmission in which said input side pressure application device performs the follower pulley function while said output side pressure application device performs the reference pulley function; and

a control device for supplying via both said two driving sources a rotation speed/torque regulating instruction to each said pressure application devices and said forward/reverse mode transmission switching instruction to said transmission mode selection means, so as to perform a higher transmission efficiency in a variable speed range using both axial torque controls of said input and said output pulleys, and the expansion of a transmittable speed ratio range width using a forward/reverse mode transmission switching operation.

52. (New) The speed control system for said transmission according to claim 51, wherein said when said belt is of a press-type, both said pressure application devices perform said forward mode transmission in a larger speed ratio range and said reverse mode transmission in a smaller speed ratio range.

53. (New) The speed control system for said transmission according to claim 51, wherein said when said belt is of a pull-type, both said pressure application devices perform said reverse mode transmission in a larger speed ratio range and said forward mode transmission in a smaller speed ratio range.

54. (New) The speed control system for said transmission according to claim 51, wherein said transmission mode selection means has said pressing force supply path, said elastic force supply path and said driving sources connected thereof, used in common and applied said forward/reverse mode transmission switching instruction as well as said rotation speed/torque regulating instruction.

55. (New) The speed control system for said transmission according to claim 51,

wherein said control device compensates lowering of transmission efficiency occurring in a low-speed range and/or a high-speed range while said forward mode transmission or said reverse mode transmission is performed, by the additional use of a controlled semi-elastic force.

56. (New) The speed control system for said transmission according to claim 51, wherein said control device makes said input pressure application device interrupt or supply the pressing force to said input pulley, synchronizing with said output pressure application device when said output pressure application device supplies or interrupts the pressing force to said output pulley, respectively.

57. (New) The speed control system for said transmission according to claim 51, wherein said control device regulates a gap between two sliders of said engagement device so that said gap is constant by means of a superposing pressing end or an individual pressing end upon the disengaging operation of said engagement device.

58. (New) The speed control system for said transmission according to claim 39, wherein said speed control system for said transmission is applied to a variable speed control apparatus of a constant power transmission type continuously variable transmission for a vehicle.

59. (New) A speed control system for a transmission comprising a variable pitch first pulley including one or two movable disk(s), a variable pitch second pulley including one or two movable disk(s), and an endless belt wound around said first and said second pulleys, said speed control system comprising:

a first and a second pressure application device each having a compressing device supplying at least a pressing force or an elastic force to said movable disk, in which said first pressure application device has a pressing force supply path led to said movable disk of said first pulley and said second pressure application device has an elastic force supply path led to said movable disk of said second pulley;

a switching device for switching respective to a switching instruction between a forward mode transmission in which said first pulley as an input pulley of said transmission performs a reference function while said second pulley as an output pulley of said transmission performs a follower function, and a reverse mode transmission in which said second pulley as said input pulley of said transmission performs the follower function while said first pulley as said output

pulley of said transmission performs the reference function;

at least a first or a second elastic device connected in series with said elastic force supply path of said first or said second pressure application device to apply the elastic force to at least said first or said second pulley, respectively; and

a control device for giving said first and said second pressure application devices a function of individually regulating the pressing force and the elastic force, and said switching device a function of transmission mode switching between roles of the reference function and the follower function, in order to enlarge a transmittable speed ratio range of said transmission.

60. (New) The speed control system for said transmission according to claim 59, wherein said control device provides said regulating instructions and said switching instruction as electric signals to be converted to mechanical signals by said driving sources and said switching device.

61. (New) The speed control system for said transmission according to claim 59, wherein said switching device changeably gives said transmission said forward mode transmission or said reverse mode transmission in accordance with the switching operation of pulley role functions for said first and said second pressure application devices.

62. (New) The speed control system for said transmission according to claim 61, wherein said switching device has a first and a second engagement device each connected in series to said pressing force supply path in each said first and said second pressure application devices.

63. (New) The speed control system for said transmission according to claim 62, wherein said control device supplies the switching instructions to both said pressure application devices, so that the pressure application is performed on one of the pressing force supply paths while the pressure removal is performed on the other pressing force supply path.

64. (New) The speed control system for said transmission according to claim 59, wherein said control device has rotation speed sensors for said first pulley and said second pulley, and switches between the transmission mode operations at an arbitrary speed ratio or at an output side rotation speed on said second pulley side based on a radius of said belt.

65. (New) The speed control system for said transmission according to claim 59, wherein said switching device changeably gives said transmission said forward mode

transmission or said reverse mode transmission in accordance with the switching operation of power supply paths to said first and said second pulleys.

66. (New) The speed control system for said transmission according to claim 59, wherein both said pressure application devices perform the forward mode operation in a large speed ratio range and the reverse mode operation in a smaller speed ratio range when said belt is of a press-type, and perform the reverse mode operation in a large speed ratio range and the forward mode operation in a smaller speed ratio range when said belt is of a pull-type.

67. (New) A speed control system for a transmission comprising an input shaft, an output shaft, a variable pitch input pulley including one or two movable disk(s), a variable pitch output pulley including one or two movable disk(s), and an endless belt wound around said input and said output pulleys, said speed control system comprising:

a first pressure application device including a first input and a first output pressure application device each having a compressing device supplying at least a pressing force or an elastic force to said movable disk, in which said first input pressure application device forms a pressing force supply path directly led to said movable disk of said input pulley while said first output pressure application device forms an elastic force supply path indirectly via a first elastic member compressed in series led to said movable disk of said output pulley, so as to provide a forward mode operation to said transmission;

a second pressure application device including a second input and a second output pressure application device each having a compressing device supplying at least a pressing force or an elastic force to said movable disk, in which said second input pressure application device forms an elastic force supply path indirectly via a second elastic member compressed in series led to said movable disk of said input pulley while said second output pressure application device forms a pressing force supply path directly led to said movable disk of said output pulley, so as to provide a reverse mode operation to said transmission;

a switching device for changeably selecting one of said forward and said reverse mode operations to perform higher transmission efficiency than the other, and to transmit power between said input shaft and said output shaft of said transmission responsive to a switching instruction; and

a control device for supplying regulating instructions to said first and second pressure

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application devices and said switching instruction to said switching device and giving said transmission a wider transmittable speed ratio range.

68. (New) The speed control system for said transmission according to claim 67, wherein said first and said second pressure application devices are a singly shared pressure application device, in which said input and said output pressure application devices can changeably give said forward mode operation or said reverse mode operation respective to said switching instructions.

69. (New) The speed control system for said transmission according to claim 67, wherein in said first and said second pressure application devices, each said compressing device includes a compound compressing device formed of a ball-screw operated by a worm transmission, or a hydraulic cylinder operated by a hydraulic valve.

70. (New) The speed control system for said transmission according to claim 69, wherein in said first and said second pressure application devices, said compound compression device includes a superposing pressing end that receives the amount of displacement caused by both a primary compressing device and a secondary compressing device responsive to two instructions, and an individual pressing end that receives the amount of non-superposed displacement caused by either said primary compressing device or said secondary compressing device, or two individual pressing ends that receive the amounts of displacement caused by said primary compressing device and said secondary compressing device, respectively.

71. (New) The speed control system for said transmission according to claim 70, wherein both of said pressure application devices synchronously or asynchronously regulate a speed ratio using said individual pressing ends and torque using said superposing pressing ends.

72. (New) The speed control system for said transmission according to claim 67, wherein said control device regulates axial torque of said input and said output pulleys applied said elastic force and said semi-elastic force during at least said forward mode operation or said reverse mode operation.

73. (New) The speed control system for said transmission according to claim 67, wherein said each pressure application device is disposed of said elastic device to a side of said movable disk and said compressing devices to a side of a body of said transmission.

74. (New) The speed control system for said transmission according to claim 67, wherein said switching device switches at an intermediate speed ratio point of an entire transmittable speed ratio range, resulting to maintain higher transmitting efficiency in a widened speed ratio range.

75. (New) The speed control system for said transmission according to claim 74, wherein said switching device is transmission mode selection means for operating in a manner that said forward mode transmission continues to perform a torque/speed ratio control while said reverse mode transmission keeps on stopping, and said reverse mode transmission continues to perform the torque/speed ratio control while said forward mode transmission keeps on stopping.

76. (New) The speed control system for a transmission comprising a first transmission device and a second transmission device each including an input pulley and an output pulley composed of variable pitch pulleys having at least one or two movable disk(s), and one or two endless belt(s), said speed control system comprising;

a first input and output pressure application device for variably speed/torque controlling said first transmission device, and giving one of said first and said second pulleys a reference function by applying a pressing force and the other a follower function by applying an elastic force;

said first transmission device performing higher transmitting efficiency in a first speed ratio range of an entire speed ratio range than said second transmission device;

a second input and output pressure application device for variably speed/torque controlling said second transmission device, and giving one of said first and said second pulleys a reference function by applying a pressing force and the other a follower function by applying an elastic force;

said second transmission device performing higher transmitting efficiency in a second speed ratio range of an entire speed ratio range than said first transmission device;

a switching device changeably selecting, alternatively, said first transmission device or said second transmission device, responsive to a switching instruction; and

a control device capable of enlarging an entire transmittable range of high transmission efficiency into more widened range in combination with said first speed ratio range in said first

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transmission device and said second speed ratio range in said second transmission device by way of supplying said switching instruction.

77. (New) The speed control system for said transmission according to claim 76, wherein in said first and said second transmission devices, said input pulleys and said output pulleys are a single input pulley and a single output pulley, respectively.

78. (New) The speed control system for said transmission according to claim 76, wherein said first and said second input and output pressure application devices are comprised of a single input pressure application device and a single output pressure application device.

79. (New) The speed control system for said transmission according to claim 59, wherein said speed control system for said transmission is applied to a variable speed control apparatus of a constant power transmission type continuously variable transmission for a vehicle.